The lines at 5129·4, 5112·1, and 5142·2 were much broadened in the spot; D and F were about one-third as broad again, and upwards of 300 lines between D and F were noted as being more or less affected.

On Nov. 30 the above-mentioned bands were not so marked, but the C and F lines were much broader (about doubled in breadth), and many lines between B and *b* were very much darkened and broadened. The *b* lines were hardly affected.

The observations were made by Mr. Christie and Mr. Maunder with the half-prism spectroscope, mounted on the Great Equatoreal. A train of two prisms, giving a dispersion of about 80° from A to H, was used, with a magnifying power of 10 on the viewing telescope.

On 1880 Oct. 1 a strong dark line at W. L. 5146·3, not corresponding to any line in Ångström's map, was seen in the spectrum of two Sun-spots. This dark line, though resembling in character those mentioned above, does not correspond in position with any of them.

The figure represents a portion of Ångström's map of the solar spectrum near *b*, with the spectrum of the Sun-spot below, showing the dark bands. In the case of the other lines the length represents the amount by which the line is broadened—full length corresponding to a line which is doubled in breadth; half length, to one of which the breadth is increased by one half; and so on.

Royal Observatory, Greenwich,
1880, *December* 7.

Telegraphic Determination of the Longitude of Shanghai.
By Dr. L. S. Little.

The completion of the submarine telegraph cable to Shanghai suggested to me that it was desirable to obtain the value of the longitude by its means. Shanghai being the most important port in China, an accurate determination is of importance to navigation, even if I did not require it for my own Observatory work, and to correct the value I had obtained by occultations and Moon culminations.

Shanghai is in telegraphic communication with Europe by two routes—a southern, *viâ* Hongkong and India, and a northern, *viâ* Japan and the Russian Empire.

The positions of several points in Japan were determined telegraphically by the various parties sent out to observe the last transit of *Venus*.

One of these points was the telegraph station at Nagasaki, and I am indebted to Prof. A. Hall, of the Naval Observatory at Washington, for the longitude of that point.

The telegraph station at Nagasaki is connected with that of Shanghai by

426 miles	submarine cable		Nagasaki to Gutzlaff,
57 ,,	,,		Gutzlaff to Woosung,
9 ,,	land line		Woosung to Shanghai.

In 1875 Vice-Admiral Ryder, Commander-in-Chief on the China station, directed Commander Dawson, of H.M.S. "Dwarf," with Lieutenants Bedford and Greaves, officers specially charged with surveying duties, to carry out the work at Nagasaki.

Lieut. Dreyer, of the Royal Danish Navy, Director of the Great Northern Telegraph Company in Shanghai, kindly placed the line at our disposal after ten o'clock at night without relays or breaks at Woosung or Gutzlaff.

The bell of Wheatstone's Morse instrument and the key of Wheatstone's (double current) instrument were used.

At Nagasaki local time was obtained by the observation of equal altitudes of the Sun by two observers independently. The observations consisted of from three to four sets of five each, both morning and afternoon, and were made in the yard of the telegraph office, where a mean-solar-time chronometer was kept during the week the work was going on.

At Nagasaki the weather was fine throughout.

At Shanghai local sidereal time was obtained by means of a fixed transit instrument and a marine sidereal chronometer beating half seconds. The Observatory is situate about a third of a mile from the telegraph office, and the chronometer was carried to and fro by hand.

Corrections of Nagasaki Mean Solar Chronometer, Dent No. 1505.

Date 1875.	Chronometer fast of Mean Time at Noon Bedford.	Greaves.	Mean.	Hourly Rate.	Difference between the two Observers.
	h m s	h m s	h m s	s	s
Nov. 1	3 6 32·738	3 6 34·087	3 6 33·250		1·149
				+0·2275	
2	27·535	28·260	27·791		0·725
				+0·2965	
3	20·426	21·427	20·676		1·001
				+0·2594	
4	14·310	14·590	14·450		0·280

It will be noticed that the difference between the two observers is much less on the fourth day, and this gives greater weight to the correction for that day, and to the longitude deduced from it.

Corrections of Shanghai Sidereal Chronometer, Mierendorff No. 10.

Day and Hour. 1875.		Correction.	Hourly Rate.
d	h	m s	s
Nov. 1	21·0	+12 27·06	
			+0·046
2	2·4	28·42	
			+0·077
3	21·70	29·91	
			−0·107
3	1·45	29·51	

In consequence of unfavourable weather, it was not possible to determine the instrumental errors on the first two nights as accurately as could be wished, but on the third night the errors were obtained more accurately.

The resulting longitudes determined on the three days of observation are exhibited in the following table, which gives the comparison of the values of the difference of longitude obtained from coincidences with that obtained by ten-second signals, omitting minutes.

Date 1875.	Wght.	Shanghai to Nagasaki Coincid.	10^s sig.	Diff.	Nagasaki to Shanghai Coincid.	10^s sig.	Diff.	Means adopted. Coincid.	10^s sig.	Diff.
		s	s	s	s	s	s	s	s	s
Nov. 1	1	36·68	36·59	−·19	35·81	35·73	−·08	36·24	36·16	−·08
2	2	36·20	35·95	−·25	35·36	35·17	−·19	35·78	34·56	−·22
3	5	36·41	36·35	−·06	35·67	35·52	−·15	36·04	35·94	−·10
Means		36·39	36·28	−·12	35·61	35·52	−·15	36·00	35·87	−·13

This table shows that Shanghai observed systematically too late and Nagasaki too early by about the same amount, one-eighth of a second, assuming that in coincidences there is no correction required for personal equation.

The wave and armature time varies on the different days and with the different sets of signals from $0^s{\cdot}37$ to $0^s{\cdot}44$.

From the equations of condition formed from the wave and armature times and relative lengths of the cables given in Commander Green's telegraphic determinations of longitudes in the West Indies, the following values were found:—

$$x = \text{armature time} = 0^s{\cdot}2971,$$

$$y = \text{wave time for 100 miles} = 0^s{\cdot}0175 = 5700 \text{ miles in a second.}$$

Applying this value of x to the mean wave and armature time obtained as above, $y = 0^s{\cdot}0186$, or nearly the same value as that found by Commander Green.